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Volume VI June 1955 Number 2

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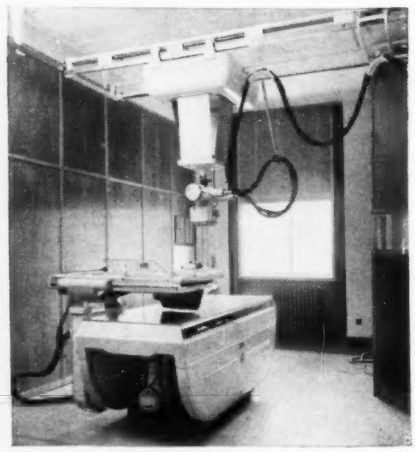

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THE JOURNAL OF THE
CANADIAN ASSOCIATION OF RADIOLOGISTS

Volume VI June 1955 Number 2

OPERATIVE CHOLANGIOGRAPHY*

DAVID EISEN, M.Sc., M.D.
Toronto, Ontario

Surgeons operating on the gall bladder are frequently faced with the question — is there a calculus in the bile duct and shall the duct be explored? Opening the duct prolongs the period of convalescence and increases the complications and the mortality, hence is to be avoided if possible. On the other hand, not to explore the duct involves the risk of leaving a stone there which might require a second operation.

Operative cholangiography was developed to supply a radiologic aid to the surgeon's clinical judgment. It is not new, having been introduced some 25 years ago. At the New Mount Sinai Hospital it has been routine practice for the past 2 years. In this paper I shall present a few of our experiences in this regard.

The surgical part of the technique consists in the injection of 10 cc of 35% Diodrast or other aqueous radiopaque solution into the common duct. This is best done through a ureteral catheter threaded into the cystic duct and tied in. If the cystic duct is too narrow to admit a catheter, then the contrast material can be injected directly into the common duct by a special long, angled needle. The latter method, however, has the disadvantage of leaving a hole in the duct which may leak bile for several days and set up a local peritoneal irritation. Preferably the injection should be made before removing the gall bladder.

Two injections are made. The first injection, of about 3-5 cc, depending on the size of the duct, is intended merely to fill the bile duct and its tributaries without flooding the duodenum, which might obscure the lower end of the comon duct. The second injection is intended to demonstrate patency by filling the duodenum or obstruction by dilating the biliary tree and it branches. The pancreatic duct may also be filled. Calculi, especially when not associated with obstruction, are more apt to show up with the first injection.

The anesthetist plays an important role; he must control the patient's breathing during the x-ray exposure. Under general anaesthesia he can produce temporary apnea by manipulation of the re-breathing bag or by the injection of succinyl choline (20-40 mg). He indicates to the surgeon when to start his injection and to the x-ray technician when to begin the exposure. Without proper team-work between these three the films are apt to be poor.

A 14 x 17 casette tunnel with a built-in grid is placed on the operating table at about where the field of operation will be. Padding of a proper thickness is placed at the head-end and foot-end of the tunnel so as to provide a level surface for the patient to lie on. The patient is positioned on the table so that the region of the bile duct will be near the centre of the cassette.

When indicated by the surgeon a mobile x-ray machine, with the tubehead covered by a sterile pillow case, is wheeled into position. If the catheter is used there is time for the surgeon to step away from the table after completing the injection. If the needle is used the exposure should be started immediately after the completion of the injection to obtain a good film. Unnecessary exposure of the surgeon to radiation should be avoided. Measurements which we have made reveal that with the two exposures the field of operation receives about 450 milliroentgens. Hence a surgeon who uses this procedure frequently should not expose his hands to radiation. A few feet away from the table the radiation is negligible.

X-Ray Technique

The factors are 70 - 80 KV, 30 MA, 30 in. dist., 2½-4 sec., exposure. Films are developed immediately, preferably in a Dark Room located on the Operating Floor. They should be ready for inspection in 6 - 7 minutes. If not satisfactory for any reason the examination may be repeated.

The trips to the operating room can become quite a nuisance to the radiologist but the time spent there can be reduced to a minimum by an arrangement with the O.R. supervisor to call the X-Ray Department when the technician has taken the films. This allows the radiologist time to get to the operating room while the films are being processed. On occasions when the radiologist cannot leave the Department the films can be brought to him and the report telephoned to the operating room. This takes a few extra minutes but satisfactory work can still be done.

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*Presented at Annual Meeting, The Canadian Association of Radiologists, January 12, 1955, Ottawa.

X-Ray Findings

The normal common ducts in our series varied in diameter between 2 and 10 mm., averaging 6.5 mm. The first injection usually fills the duct and shows some contrast material in the duodenum. The hepatic ducts and their tributaries are not distended and the distal radicles are usually not filled. No filling defects are seen. Air bubbles may be difficult to distinguish from calculi. They may be reduced to a minimum by the surgeon filling his catheter or needle with contrast material before insertion into the cystic or common duct. Similarly spasm at the sphincter of Oddi may be a problem. It can be recognized by the fact that the duct tapers to a point at its lower end and that although no contrast material enters the duodenum the duct is little if at all dilated. To prevent its occurrence morphine should not be used as a pre-operative medication.

The obstructed duct has a diameter about twice that of the normal, varying, in our series, between 9 - 19 mm., averaging 12.6 mm. There is greater backing up into the smaller radicles of the hepatic ducts and these are dilated. Calculi present themselves as negative shadows in the dilated duct. Stones may also be present, however, in a normal-sized duct and it is in these cases that operative cholangiography is most useful, as these calculi may easily escape detection without x-ray.

If the common bile duct is opened and a stone or stones removed, it should always be re-examined by a second injection through the T-tube before the wound is closed. Most surgeons feel that this secondary cholangiography is the more important use of this procedure.

Case Reports

Case 1: Mr. A. B., age 50 complained of attacks of pain across the abdomen, lasting 5 to 7 days, and not associated with jaundice. Operative cholangiography revealed that the common bile duct was not dilated (9 mm.) Two match-head sized calculi were seen in the lower end of the duct. There was no obstruction. The duct was opened and 2 calculi removed.

Case 2: Mr. W .S., age 54, had repeated attacks of pressing pain in the epigastrium in the past 1½ years, without jaundice. X-ray showed a non-functioning gall bladder. Preoperative diagnosis was subacute cholecystitis with cholelithiasis. Cholangiography showed that the bile duct was slightly dilated—11 mm in diameter. Two match-head sized calculi were seen in it. On exploring the duct one stone was removed and the other was pushed down into the duodenum.

Case 3: Mrs. S.K., age 29, had pains in the gall bladder area for several years. Two weeks ago had jaundice for a short time. Preoperative diagnosis — gall stones. Cholangiogram revealed that the common duct and the cystic duct were slightly dilated. Three calculi were seen near the lower end. These were removed by opening the duct and a second cholangiogram showed the duct clear.

Fig. 1 — Case 3 — Three calculi seen in lower end of common duct which is not dilated. The upper calculus is triangular, the lower two appear square.

Case 4: Mrs. V. C., age 40, had attacks of right upper quadrant pain associated with nausea and vomiting but not jaundice. Cholangiogram revealed a pea-sized calculus in the lower end of the bile duct, which was not dilated — 9mm diameter. The calculus was not obstructive and was located distal to the junction of the common bile duct and the pancreatic duct, the latter being filled completely. There was no backflow into the hepatic ducts. Following removal of the calculus the appearance became normal.

Fig. 2 — Case 4 — Pea-size, rounded claculus in lower end of bile duct which is not obstructed. Note filling of entire pancreatic duct which is slightly dilated above its entrance into common bile duct.

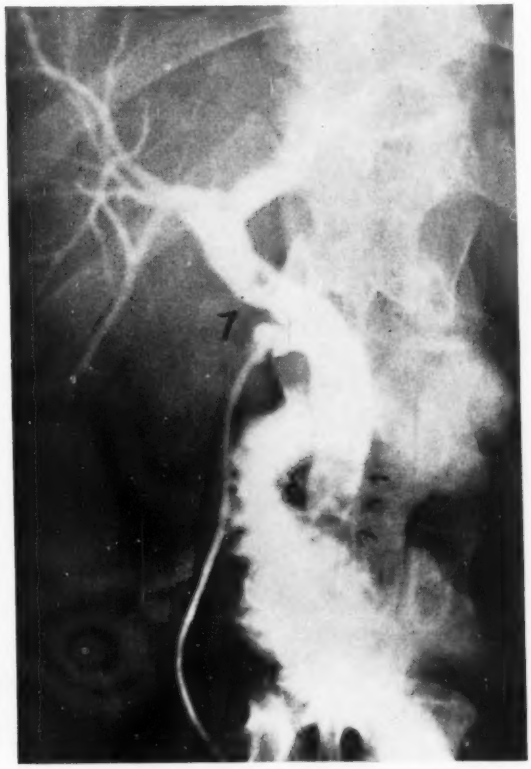

Fig. 3 — Case 5 — Common bile duct slightly dilated and containing numerous calculi. Duct not obstructed. Calculi not palpated by surgeon. Twenty calculi removed.

Case 5: Mrs. C. B., age 32, had cholecystic indigestion for the past 7 years. X-ray showed gall-stones. There was no jaundice, fever or chills. Pre-operative diagnosis — cholelithiasis. At operation it was noted that the bile duct appeared slightly dilated but the surgeon could not palpate any calculi in it. Cholangiography revealed that the bile duct was slightly dilated - 14 mm. There were numerous calculi in the duct but these did not obstruct the duct much. The duct was opened and 20 calculi were removed. A second cholangiogram revealed that the bile duct was now smaller and the backflow less.

Case 6: Mrs. M.B., age 68, had a history of attacks of indigestion and jaundice. Operation revealed that the gall bladder was thickened but contained no calculi. The common bile duct was dilated. It was opened and probed but no calculus was found. A T-tube was inserted and tied in. Cholangiogram showed that the bile duct was dilated - 17mm. There was a single calculus, measuring 10 mm in diameter within it. Just below this the duct became smaller and tortuous - 5mm. in diameter. Following this the common bile duct was re-explored and the calculus found and removed. A second cholangiogram revealed no further calculi but some fibrosis of the lower end of the duct.

Case 7: Mrs. M.D., age 77, had attacks of upper abdominal pain for the past 8 years with jaundice. Physical examination revealed tenderness over the gall bladder. Operation revealed that the common duct was dilated. It was opened and considerable mud-like, inspissated bile was removed. Cholangiogram revealed that the bile duct was markedly dilated - 19 mm. There was a large, square calculus in the upper part of the duct above the T-tube. No dye entered the duodenum. The duct was again explored and the large calculus removed and the duct irrigated. A second cholangiogram showed numerous smaller calculi in the lower end of the common duct. The duct was then explored for the third time; several small stones were removed and the duct was again irrigated. A third cholangiogram was then done. This revealed that the duct was now slightly patent but additional calculi and biliary mud were seen. Because of the patient's condition, it was felt to be inadvisable to prolong the operation by further exploration of the duct.

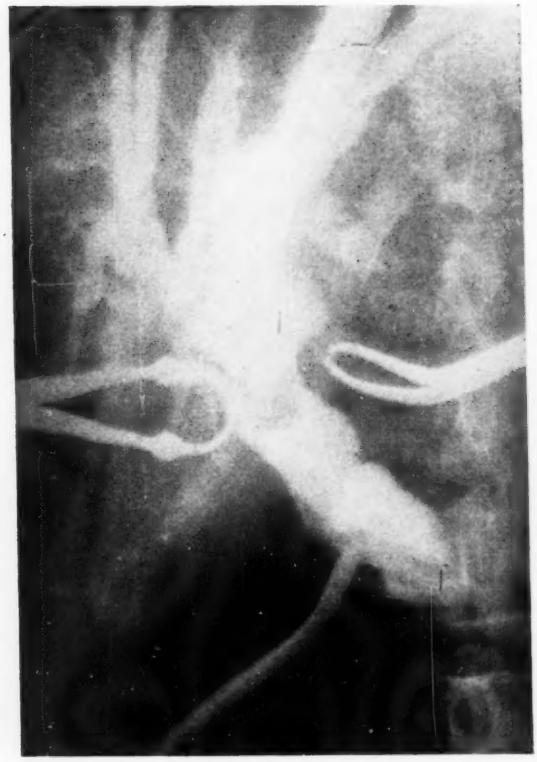

Fig. 4 — Case 7 — Markedly dilated common duct with obstruction. Large square residual calculus seen above cross-arm or T-tube.

Fig. 5 — Case 7 — After third exploration of duct with removal of additional calculi, duct now slightly patent but some calculi still present in lower portion of duct.

Summary

Operative cholangiography provides a useful roentgen aid to the surgeon in the diagnosis of duct stones. The technique of this procedure is given together with our experiences in this regard during the past two years.

The case reports are chosen to illustrate the following principles;

(1) that a calculus may be present in the bile duct without being clinically suspected;

(2) in particular, that jaundice need not be present with duct calculi;

(3) that even a large calculus need not obstruct the duct;

(4) that the duct, as exposed at the operation, may contain calculi and yet be of normal size;

(5) that in the unopened duct calculi may be present and yet not be palpable to the surgeon's fingers;

(6) that following choledochostomy one or more residual calculi may be present within the duct and yet remain undetected by the usual surgical tests.

THE PROBLEM OF EVALUATION OF CANCER THERAPY

A plea for the use of controls*

FRANK BATLEY, M.B., CH. B., D.M.R.T.
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Speaking here in Ottawa does not give me the right to claim to be a political analyst, least of all an analyst of American politics. May I tell you however that it was not until I came to North America that I met an American democrat. Without exception, all the Americans I had known were republicans. Republicans tend to belong to the wealthier classes, and as the crossing of the Atlantic needs a certain amount of wealth, so the Americans I had met in England were a selected group. You will realize that my impressions were the result of a simple statistical error.

In treating malignant disease, we continually meet selected groups and therefore extreme caution is necessary when making deductions from our results. Recently there has been increasing criticism of the way we use figures as evidence when presenting results of therapy. Park and Lees[10], in a critical review of the validity of the figures published for mammary cancer, suggest that the 5-year survival rate has not been improved by more than 5-10 per cent! Mackinnon[7], from similar evidence and a review of mortality rates, feels that this disease is totally unaffected by treatment. These arguments have been countered by Kraus[3], Smithers[13] and McCormick[6]. We should leave this war to the statisticians for they alone are equipped to fight it, but such neutrality should not prevent us learning from the conflict. If we continue to collect more cure-rate figures as we have in the past, then the criticisms will continue and seeing that we have now been warned, they will become more embarrassing. But this is to jump ahead; let us first develop an argument keeping the mathematics of statistics in the background.

Table I apparently shows the effect of biopsy on the prognosis of carcinoma of the breast. One might expect that a biopsy prior to mastectomy would worsen the results, but hardly that it could improve the results as these figures suggest. This illogical result is because definite cancers do not need a biopsy prior to operation. But definite cancers are more advanced than the doubtful lesions needing biopsy. Therefore one group is loaded with advanced lesions, accounting for the poor survival rate, so that a fruitful comparison between the groups is impossible. In these figures the nonsense is obvious, but there may be instances where a wrong inference is drawn from the comparison of cases because this loading is not obvious. Medical literature is full of claims for improved therapy based on this kind of deduction. An article containing figures should be always be submitted to a statistician for his advice. He will tell you not only how to watch for such bias but also how much detail about the figures is necessary. If figures are to be used to add weight to an opinion, then they should be detailed enough to make a critical analysis of them possible. Without such detail they add nothing to the argument; they are merely another opinion.

TABLE I

Influence of Biopsy prior to Radical Mastectomy for Carcinoma of the Breast
Haagensen and Stout 1942

	Five Year Survival Rate
401 Mastectomies without biopsy	28%
220 Mastectomies with biopsy	50%

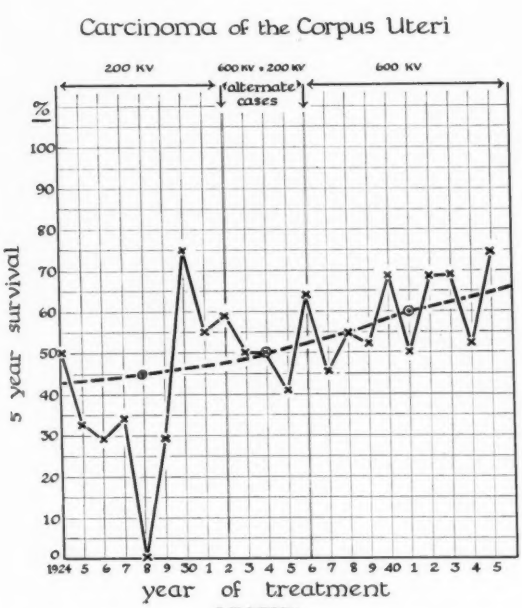
Table II shows results published by Leucutia[5] in 1952, for treatment of carcinoma of the body of the uterus. It shows the overall survival rates for three different periods. From 1924 until 1932, in addition to radium, and surgery for operable cases, 200 K.V. x-radiation was used. In 1932 a high voltage machine of 600 K.V. was installed. Between 1933 and 1936 this was used alternately with the 200 K.V. machine, but after 1936 the 600 K.V. machine was used exclusively. It was claimed that the improvement shown was due to the use of the high voltage machine and the figures at first sight are impressive.

TABLE II

CARCINOMA CORPUS UTERI
Leucutia 1952

Period	Cases	5 year survival	
		Cases	per cent
1924-1931	53	24	45
1933-1936	35	18	50
1937-1945	152	91	60

*Presented at Annual Meeting, The Canadian Association of Radiologists, January 12, 1955, Ottawa.



LEGEND

Fig. 1 — Solid line shows 5 year survival rates plotted against year of treatment. Circles show the positions of the averages for the three periods, as shown on Table II, and the dotted line is a curve drawn through them.

Figure I shows the yearly survival rates plotted against the years of treatment. The irregularity of the graph on the left is due to the very small numbers in each year. For instance in 1928 only one patient was treated, and she died, lowering the survival rate for that year to zero. The circles are the positions of the average survival rates as shown in Table II and the dotted line is a curve drawn through them, its slope showing the average improvement in the survival rate. You will observe that there has been gradual improvement throughout the whole period from 1924 to 1945. It is important to notice that this improvement has been continuing since 1936, though the 600 K.V. machine has been in continual use since then. What is the explanation for the latter improvement? It must surely be due to factors other than the 600 K.V. machine and therefore it is possible that these other factors have produced the whole slope of the curve from 1924 to 1936, as well as since 1936. A gradual improvement in technique would produce such an improvement; or perhaps the department has been gradually seeing earlier cases throughout the period. The claim that the 600 K.V. machine has produced the improvement is not, in our opinion, warranted.

I chose these figures as an illustration because there was sufficient information in the article to make this detailed analysis possible, but similar criticisms must apply to other figures also. How are we to establish the value of our cobalt units when the material we receive is changing? These new units have encouraged surgeons to send us earlier cases of some diseases, more advanced cases of others, and if we also allow some selection for treatment with this machine we shall make analysis even more difficult.

One might hope that staging cancer patients would reveal a change in material so that if an improvement in results were due to earlier cases being seen, this would be apparent. For how otherwise can we compare results between different periods and between different centres? However the fallacies of of staging are now well known and to illustrate this problem we performed a simple experiment. Twenty sand bags were prepared, each containing a different number of marbles. Examiners were asked to palpate these bags and decide how many marbles each contained and so stage them in the following way: —

TABLE III
MARBLES EXPERIMENT

	STAGE I	STAGE II	STAGE III	STAGE IV	OVERALL
Dr. A.	59%	26%	20%	0%	34%
Dr. B.	80%	54%	27%	11%	34%
Correct Assessment	64%	38%	20%	1%	34%

The same 'patients' staged by two examiners
0 — 5 marbles — Stage I
6 — 10 marbles — Stage II
11 — 15 marbles — Stage III
16 — 20 marbles — Stage IV

Each bag was given a definite survival rate depending on the number of marbles it contained. When these bags were grouped according to stages an average survival rate for any stage could be obtained by averaging the survival rates for the bags placed in that stage. The correct survival rates, if each bag was accurately staged, are shown on the bottom line of Table III. You will see however that the two examiners achieved very different survival rates. Dr. B. obtained a much higher survival rate in each stage — he even obtained 11% in Stage IV. Of course the overall survival rates remain the same; they are the same 'patients'. Dr. B. obtained these very creditable results by being pessimistic and over-estimating the number of marbles in each bag. He had only very few patients in Stage I and these were the earliest, so that he obtained a high survival rate. The others belonging to Stage I he moved into Stage II and by the process of moving the late Stage IIs into Stage III he obtained a group of patients in Stage II which were early compared with the correct assessment, with therefore another high survival rate. A repetition of this tenden-

cy in the other stages produced this fine result in Stage IV. But Dr. B. did not save one more 'patient' than did Dr. A; they are the same 'patients'.

This may be seem a long-winded explanation, but patients are as difficult (if not more difficult) to stage than bags of marbles and the divisions between stages are not so precise as in this experiment, so that the same errors must apply to the results in our clinics. We know that even where the same staging descriptions are used, different centres interpret the stages differently. Thus it is our considered opinion that the present methods of comparing results by stages will be more often misleading than helpful.

The faults of staging do not affect the overall survival rate, but I have suggested that even the overall survival rates will show changes not resulting from treatment. How are we therefore to decide which treatment is better? How indeed? And this problem is very real. If we consider the problem of carcinoma of the breast, Haagensen and Stout[2] have figures to show that radical mastectomy is the treatment of choice, and that radiotherapy is of no value. McWhirter[8] feels from his figures that simple mastectomy with post-operative x-ray therapy is best. Nohrman[9] presents figures suggesting that pre-operative radiation is preferable. Adair[1] speaking of pre-operative radiation stated 'that it is costly in human life' and Taylor[14] speaking of McWhirter's proposals said 'that it is terribly deplorable that such a retrogressive heresy should be proposed'.

All of these gentlemen cannot be correct. Their claims are not supported by true statistical proof. Some, if not all, contain the fallacies I have described. Yet it is important that we should know the true answers, otherwise no progress can be made. How can we hope to persuade laryngologists that radiotherapy is better than surgery for early carcinomata of the larynx, when the surgical 'figures' are better? Surgeons are sympathetic when we point out that a group of patients treated by radiotherapy contain many more advanced lesions than the surgical groups. But sympathy is not enough, for sympathy will not win for our specialty the coveted title of treatment of choice. I feel that with comparable cases we could win this title.

The solution of these problems is by no means easy, but we should realize that the problems do exist and that their solution is of prime importance. Without an answer many valuable procedures and treatments will go unrecognized and be discarded, while useless methods, especially if backed by an 'authority', will become fashionable. In a recent leading article in the Lancet[4], after a discussion of this problem a strong plea was made for the use of controlled series in cancer work, testing as they put it 'drastic remedies against simple remedies'. Undoubtedly the best time to set up such a series is when a new treatment is first introduced. Such a new treatment may be better, it may be worse. It is certainly an experiment with patients. There is no ethical reason against trying the treatment on half the patients to prove whether or not it is better. The selection of patients for either treatment must of course be completely random and sufficient numbers of patients must be treated to allow the many possible variables to fall equally into either group. Using this technique it has been shown that in a trial series with early cases of rheumatoid arthritis[12], aspirin is as successful as cortisone, at least as regards results to a year from commencement of therapy; and that in pulmonary tuberculosis isoniazid is slightly better than a combination of steptomycin and P.A.S. Both these were problems on which widely divergent opinions were held; opinions derived from observing different types of cases and the natural tendency to be enthusiastic for new methods of therapy.

In order to obtain sufficient patients for these tests several clinics would need to cooperate as was done with the medical treatments mentioned. That our work directly involves lives makes the need for these tests more urgent, but of course needs more courage. In one way we have an advantage. In the main, the value of cancer therapy is judged from the number of survivals. The death of a patient is an easily ascertained fact and is not subject to differing opinions. With many medical problems, a successful treatment must be judged on subjective evidence making comparative studies difficult to interpret.

Although this type of research will play an important part in cancer therapy and is now being used in some centres, there are some problems that it cannot solve. In radiotherapy some techniques are complicated and contain a considerable amount of 'know-how' — 'know-how' which cannot be described. If one centre started a controlled series to compare a foreign technique with its own, then the foreigners could claim that the lack of success with their treatment was due to its wrong application.

A possible solution to this difficulty is that of matching cases. This is in reality a refinement of staging that takes into account the faults of staging and an elaborate arrangement is necessary to avoid these faults. A patient appearing at one centre is described in detail with diagrams. These details are then

sent to the second centre where this patient is matched with another patient, whose extent of tumour, age, etc. are similar to the first. These patients then become a pair for comparison. Thus each centre uses the type of treatment to which they are accustomed. When the results of therapy mature, the two groups of matched patients are compared, all other unmatched patients being ignored.

Although this type of investigation is simpler to envisage than a true control series within a clinic, and would be easier on the conscience to start, it would need more careful planning to avoid fallacies creeping in.

It is often remarked that one can prove anything with figures; this merely indicates a poor use of the word 'prove'. If figures are to be asked to answer a problem, their collection must be planned so as to be without bias. We feel the time is ripe for such planning.

White sheep eat more than black sheep. The 'proof' of this is obvious when you realize that there are more white sheep than black sheep.

Summary

1. The composition of series of patients with the same disease will vary from clinic to clinic and will vary over different periods in the same clinic.
2. Therefore published results of the treatment of the same disease have so many variables that they are of little value as comparisons of methods of treatment.
3. Staging is a crude device which is more misleading than helpful in solving the problem.
4. The above considerations are so important that a special effort must be made to obtain controlled series either by: —
   (a) random division of cases
   (b) matching of cases
   in order to produce any reliable comparisons from which the best methods of cancer therapy can be chosen.

Acknowledgment

I wish to thank Dr. A. J. Phillips, of the National Cancer Institute of Canada, for his help with this paper.

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THIRD INTERNATIONAL COURSE ON TOMOGRAPHY

The Course will be held October 3rd to 12th, 1955, at the Radiology Institute of the University of Genoa, under the direction of Professor Alessandro Vallebona.

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SARCOIDOSIS OF THE RECTUM*

A. R. McGEE, M.D. and C. R. RAPP, M.D., F.R.C.S.
Toronto, Ontario

Boeck's Sarcoid, Sarcoidosis, Besnier's disease, Schauman's disease, are names which refer to one and the same clinical entity. In recent years, however, that of Sarcoidosis, inferring a constantly though often slowly changing process, is the most generally accepted one.

The etiology is as yet unknown. Some authors suggest an attenuated form of tuberculosis, while others hold to the theory of a virus infection. Neither has been proven and indeed no particular relationship to tuberculosis has ever been established. Its ultimate identification is dependent on the histological recognition of the non-caseating granuloma.

Historical

Longscope and Freiman[1], in an excellent review of sarcoidosis, maintain that the first reported case was by Hutchinson in 1875, and that the second was by Besnier in 1889. In the same year, Boeck[2] described a patient with generalized adenopathy and bluish skin changes. At various times individual writers tended to over-emphasize certain manifestations of the disease until Schaumann[3], Martenstein[4] and others correlated these observations and established them as phases of the same general systemic affection. Thereafter, more cases were added to the literature and by 1948 Freiman[5] calculated the number to be over 1,000. It is now obvious that Sarcoidosis is of relatively frequent occurrence on this continent. Though pathological study has been largely based on biopsy material, the autopsy reports of Nickerson[6] and others have been complementary. In 1938, Pinner[7] published a review of eighteen autopsies, in ten of which sarcoidosis was not suspected during life.

The widespread involvement of the disease, in myocardium, endocardium, pancreas, testes and bone marrow has been pointed out by Nickerson[6]. Its presence in the adrenal gland has been suspected only once. Quite recently, (November 1954), a case of generalized sarcoidosis with apparent involvement and obliteration of the pituitary gland has been reported by Owen and Hennerman[9].

Despite the relatively common occurrence of sarcoidosis, and its multiplicity of sites in many organs, the gastro-intestinal tract is not a common one. In twenty-one proven cases of generalized sarcoidosis studied by X-ray, Lorber, Shay and Woloshin[10] found no intestinal involvement. Furthermore, their review of one hundred autopsied cases of generalized sarcoidosis in the literature discloses only eight with questionable intestinal sarcoid disease.

Sarcoidosis is found most frequently in the 20 - 30 years age group and, according to a study by Ricker and Clark[11], more commonly in the Negro race.

The importance of differentiation of sarcoid from sarcoid-like lesions has been pointed out by Symmers[12], Nadal and Ackerman[13], and Gherardi[14].

Pathology

The earliest macroscopic change is the grey granule resembling that of miliary tuberculosis. Despite the presence of large masses of sarcoid lesions in various areas, such as mediastinum and lung, there is no apparent necrosis.

The microscopic picture of the sarcoid granuloma is characterized as monotonous in regularity, and, whether found in skin or deep tissues, the histological appearance is precisely the same.

The United States National Research Council's description of the sarcoid granuloma is cited by Ricker and Clark[11] as follows:

> "It is characterized by the presence in any organ or tissue of epithelioid cell tubercles with inconspicuous or no necrosis and by the frequent presence of refractile or apparently calcified bodies in the giant cells of the tubercles. The characteristic lesions may be replaced by fibrosis, hyalinization, or both."

The granuloma as such remains discrete regardless of the developmental stage unless, or until, the healing state of hyalinization or fibrosis produces fusion. Lympho-reticular tissue is the most common site, followed by lung, liver, skin and bone.

The earliest granuloma is sharp of outline and composed of polyhedral cells, with acidophilic cytoplasm and large vesicular nuclei. As the lesion matures, a narrow rim of two or three layers of fibroblasts encircle it while the epithelioid cells elongate and become concentrically arranged; thus regression by fibrosis begins between and around the individual granulomata. The fibrous tissue becomes compact, hyalinizes and forms a dense scar on which only a suggestion of the previous tubercle remains.

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*Presented at Annual Meeting, The Canadian Association of Radiologists, January 12, 1955, Ottawa.

Clinical

A striking feature of sarcoidosis is the lack of relationship between the extent of the disease and the severity of symptoms. Malaise and fatigue are frequently the only complaints. The tuberculin test bears no relationship to the presence or absence of the disease. The sedimentation rate is frequently elevated.

The condition is chronic and tends toward spontaneous recovery. Occasionally, however, involvement of a vital organ results in a fatal termination.

The case about to be described is one in which the gradual progression of the disease resulted in encroachment on the upper rectum and therefore surgical intervention was necessary.

Case Report

On admission to hospital this 26 year-old male gave a four-year history of chronic constipation and for the latter half of this period his stools were ribbon-like. Also, intervals of as long as four days would pass without any bowel movement and then slight bleeding accompanied defecation. He denied any other gastro-intestinal complaint.

Physical examination revealed a man of average build and good colour. Palpation of the abdomen resulted in slight pelvic discomfort, but was otherwise negative.

Rectal Examination

On digital examination one could feel a firm, very locular mass on the posterior and lateral aspects of the rectum, which stretched as far as the finger could reach. The surface of the tumour was nodular, but free from any tenderness. It almost completely occluded the rectum, by encroaching on its lumen. There was no blood on the examining finger. Except for one small area, the tumour was covered with intact rectal wall.

Laboratory Investigation

Serum protein 7.9: A.G. Ratio 1 - 3: Haemoglobin 14.5 grams: W.B.C. 7300: Sedimentation Rate 4mms. per hour: Wasserman Test negative: Frei Test negative.

Barium Enema revealed a narrowing in the rectum which involved about two inches of bowel. (Fig. 1). The colon above this area presented no evidence of abnormality

Chest X-Rays were negative, as were films of the bones of the hands.

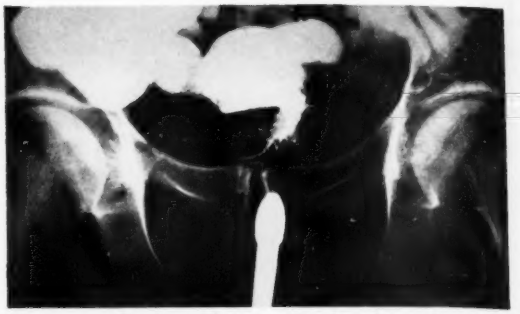

Figure 1. Barium Enema showing irregular narrowed lumen of rectum.

Sigmoidoscopic Examination

The rectum was firm and thickened, particularly posteriorly and there was a fixed nodule about the size of a walnut protruding in the mid line. A portion of this was removed for histological examination. The sigmoidoscope could be passed only three inches.

Pathological Report

Gross: The specimen consists of two pea-sized pieces of tissue. One is yellowish white and firm and the other is of whitish grey colour. There are also two smaller fragments of tissue.

Figure 2. Low Power showing distribution of sarcoid granulomata.

Microscopic Examination

Sections of the tissue show a small portion of mucosa and sub-mucosa of rectum. The mucosa is ulcerated in one area and the surface shows slough. Beneath this, there is an infiltration of endothelioid cells arranged in pseudo-tubercle formation and surrounded by round cells. No central necrosis is seen in the nodular granulomatous areas. Occasional foreign body type giant cells are seen in the nodules, but no foreign body is found. Ziehl-Neelson stains done on this tissue failed to reveal tubercle bacilli. The appearance is that of a nodular granuloma of non-specific type. (Figs. 2 & 3.)

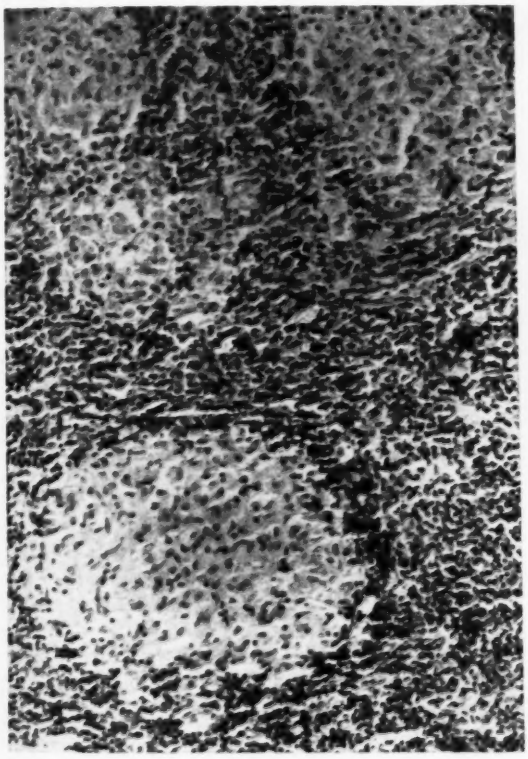

Figure 3. High Power disclosing cellular formation of sarcoid granuloma.

Diagnosis

Sarcoidosis of Rectum.

Surgical Report

Two weeks after admission a Devine defunctioning colostomy was performed. At the same time the rectum was palpated and a mass about 3½ inches long was found. This was rubbery to the touch and firmly fixed, particularly on the left lateral and posterior aspects. There were no enlarge regional lymph nodes, and no diverticula. No gross disease was demonstrable in the abdominal viscera. The patient progressed quite favourably post-operatively but a barium enema three months after discharge revealed practically no improvement in the rectal radiographic outline (Fig. 4).

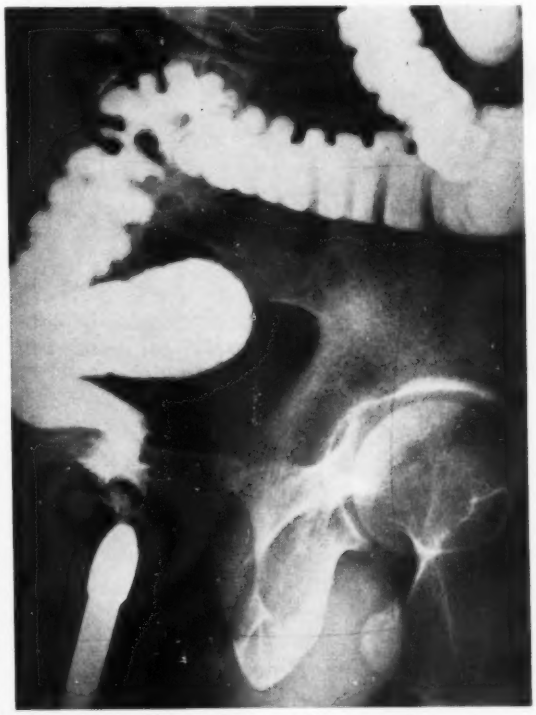

Figure 4. Film of Rectum three months post-operative. Lumen narrowed and irregular.

At the same time serum protein estimation was reported as 8.4 with an A.G. ratio of 4.2-1.

After a period of approximately two years the patient was re-admitted for assessment and further treatment. There was no evidence whatsoever of any of the original diseased tissue, either by digital or sigmoidoscopic examination.

Laboratory Investigation

Haemoglobin 14 grams: W.BC. 5300: Temperature normal: Sedimentation rate 3mms per hour: Urinalysis negative.

The continuity of the large bowel was restored. Following an uneventful nine day post-operative convalescence he was discharged from hospital. He has enjoyed good health in the three year interval since his operation. A barium enema done in December, 1954, revealed no evidence of any irregularity of contour and showed that the lumen had re-expanded approximately to normal size (Fig. 5).

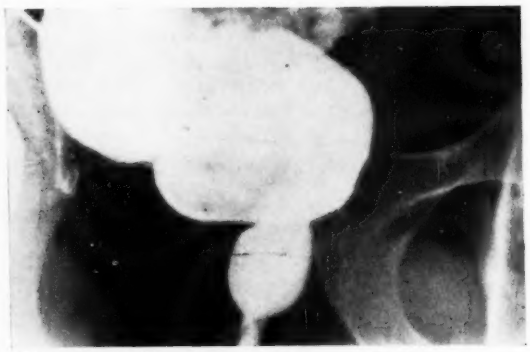

Figure 5. Three years post-operative. Rectal contour normal.

Discussion

Although there has been no sarcoid identification elsewhere to support the diagnosis, neither has any other disease been found in or near the rectum which might be considered primary or causative. There is no evidence of any glandular involvement in the drainage area. There is no history of any local trauma. The histological pattern is considered to be classical and has been pathologically accepted.

Summary

A case of sarcoidosis of the rectum has been reported. No similar case has been found in the literature. Thus another organ is added to the long list of those affected by the disease. A three year follow-up shows an apparently complete recovery following the defunctioning procedure. Final examination reveals no involvement elsewhere.

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IV SYMPOSIUM NEURORADIOLOGICUM

The meeting will be held in London from September 13th — 17th 1955. Registration will take place on September 12th at the University of London, Malet Street, W.C.1., where the scientific meetings will be held. Radiologists, neurologists and neuro-surgeons particularly are welcome.

Subjects for discussion include (i) cerebrovascular disease (ii) the localization of intracranial tumours by means of isotopes (iii) applications of stereotaxometry (iv) new techniques and (v) various preferred papers on a variety of neuroradiological subjects. Scientific and technical exhibitions are being arranged.

It is hoped to arrange a joint half-day session with the 2nd International Congress of Neuropathology which is being held simultaneously in London.

A full social programme has been arranged including visits to places of interest for wives and families of members.

Application forms and further information may be obtained from Dr. R. D. Hoare, Secretary, Symposium Neuroradiologicum, The National Hospital for Nervous Diseases, Queen Square, London W.C.1.

INVESTIGATION OF THE ACCURACY OF CHOLECYSTOGRAPHY*

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Does a radiological diagnosis of mal-functioning or non-functioning gall bladder mean that a pathological process is present? This is a question which I imagine every radiologist has been asked at one time or another. In an attempt to try and find an answer, two hundred cases, which had been examined by means of oral cholangiography, and which had subsequently undergone surgery, were reviewed. In this way both an operative note and a pathological report were available in every case.

First, let us deal with those cases in which stones were apparent radiologically. There were forty-four cases in which opaque stones were demonstrated by x-ray and at operation all had stones. Non-opaque stones were visualized in normally functioning gall bladders in fifty-five instances, and were found present at operation in each case; while in mal-functioning gall bladders, they were first seen radiologically, and subsequently found at operation in twenty-six out of twenty-six cases.

Therefore when either opaque or non-opaque calculi were demonstrated radiographically they were found at operation in one hundred percent of cases.

There were sixty-four cases in the group in which a radiological diagnosis of a non-functioning gall bladder without visible stones was made. Fifty-three revealed stones at operation, i.e. eighty-three percent. Eleven had no stones. On further consideration of these eleven cases, it was found that there was: one case of carcinoma of the gall bladder without stones, one of acute cholecystitis with no stones, one of a stone in the common bile duct, three of chronic cholecystitis (the gall bladder walls were from nine to twelve millimeters thick), two of chronic and subacute cholecystitis, and three normal gall bladders.

Thus sixty-one out of sixty-four patients had a definite pathological lesion — that is ninety-five percent.

A radiological diagnosis of a mal-functioning gall bladder without stones was made in eight cases. Stones were found at operation in five of these cases. No stones were present in the other three, however the pathological reports were as follows: chronic and subacute cholecystitis in two instances, chronic cholecystitis, with a gall bladder wall five millimeters thick, in one.

There were three cases which were operated upon in spite of a normal x-ray report. In two of these, stones were discovered. I believe that these stones would not have been missed radiographically if certain principles in positioning of the patient, which will be described later, had been adhered to.

It is well known that poor visualization or non-visualization of the gall bladder may be to various factors, many of which are extra-cholecystic in nature.

1. Failure of the patient to ingest or retain the contrast substance.
2. Failure of or delay in gastric emptying from such causes as pyloric obstruction.
3. Non-absorption of the medium due to diarrhea, pancreatic or small bowel disease.
4. Impaired hepatic function.
5. Obstruction of the cystic duct.
6. Inadequate concentration of the medium resulting from severe disease of the gall bladder mucosa.

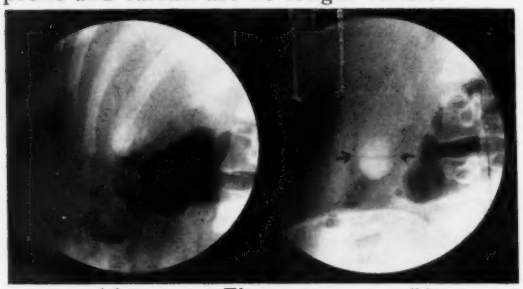
As a result of this investigation, certain prime radiological facts have become apparent. First, the necessity of repeating the examination when the gall bladder is non-functioning; second, the advisability of taking films with the patient in various positions.

If, after the patient has taken the contrast material, no gall bladder shadow is visible and none of the extracholecystic factors mentioned are present, it is not enough to assume that the gall-bladder is necessarily non-functioning. The patient should be kept fat free, given more dye and re-examined the following day. If once again no gall bladder shadow is seen, then a report of non-functioning may be given. If however, a shadow does become apparent on second examination, calculi may on occasions be demonstrated within it.

Once the gall bladder shadow is outlined, films taken with the patient prone are not sufficient, as stones may readily be missed. Figure 1 shows such a case. With the patient prone no stones are visible, however, on assuming the upright position radiolucent stones do become apparent. Note that they are floating due to the fact that the specific gravity

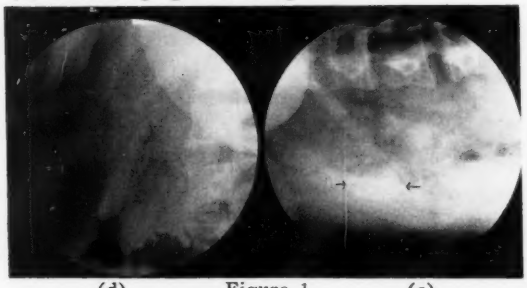
Presented at Annual Meeting, The Canadian Association of Radiologists, January 12, 1955, Ottawa.

of the combined dye and bile beneath them is greater than that above them. In the lateral recumbent position film the stones have shifted but are still floating. Following the fat meal, the film has been taken with the patient prone and calculi are no longer visible.



(a) Figure 1 (b)

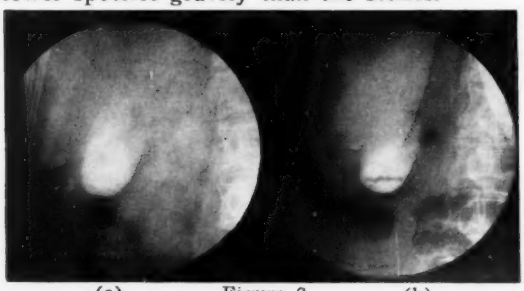
(a) Film taken with patient prone. No visible stones.
(b) Patient upright. Floating stones.



(d) Figure 1 (c)

(c) Lateral recumbent position.
(d) Post fat prone position film.

Figure 2 is merely to demonstrate the change that has occurred in the relative specific gravities of stones, dye and bile over a twenty-four hour period. The initial prone position film shows radiolucent stones and these are visualized on the upright film. Once again they are floating. Figure 3 taken following a fat meal reveals the stones to be floating no longer, but lying in the most dependant portion of the gall bladder. In this case the combined bile and dye which were previously of greater specific gravity than the stones have passed out of the gall bladder and this new bile-dye solution is obviously of lower specific gravity than the stones.

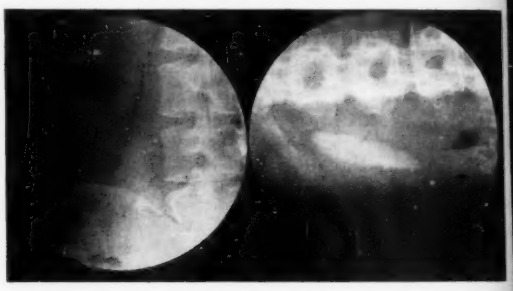


(a) Figure 2 (b)

(a) Patient prone.
(b) Upright film showing floating stones.

Figure 3

Figure 4 shows why the lateral recumbent film is so valuable. The patient showed no stones within the gall bladder when prone. An upright film shows the gall bladder lying at a very low level with the fundus obscured by the iliac crest. The lateral recumbent film however, demonstrates only too clearly that many radiolucent stones are present.



(a) Figure 4 (b)

(a) Upright film.
(b) Lateral recumbent position film.

Finally to answer our opening question: Does a mal-functioning gall bladder mean that a pathological process is present? In the event of a mal-functioning gall bladder with no stones visible radiologically; pathology was present in eight cases out eight. In the event of a non-functioning gall bladder without visible stones; pathology was found to be present sixty-one times out of sixty-four, or in ninety-five percent of cases.

Note *Grateful acknowledgments are due Dr. I.B. Macdonald, of the surgical staff, Wellesley Division of the Toronto General Hospital, who instigated this investigation, and Dr. Robert Delaney, former resident surgeon, who studied the clinical aspects.*